



TITLE:

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CITATION:

Ogawa, Kazunari ...[et al]. Notes on Japanese Ahermatypic Corals -II New Species of Dendrophyllia. PUBLICATIONS OF THE SETO MARINE BIOLOGICAL LABORATORY 2000, 39(1): 9-16

ISSUE DATE:

2000-12-25

URL:

<http://hdl.handle.net/2433/176294>

RIGHT:

Notes on Japanese Ahermatypic Corals - II New Species of *Dendrophyllia*

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Abstract Four new species of *Dendrophyllia* are described and figured. *D. suprarbuscula* n.sp. was found at 90 m, off Izu Hachijou Island, and *D. paragracilis* n. sp. in the shallow marine cave of Ogasawara Islands and Ryukyu Islands. Other two new species, *D. futojiku* n. sp. having big columellae and *D. minima* n. sp. having the smallest corallites, were found in shallow waters of Izu Hachijou Island. We revised the key to 20 species of *Dendrophyllia* and related genera in Japan including new species.

Key words: ahermatypic coral, new species, *Dendrophyllia*, key, Japan

Introduction

In this second report (first report: Ogawa *et al.*, 1997) we introduce four undescribed species of *Dendrophyllia* from Japan. Two are distinguished from hitherto known species by the septal arrangements, another one has developed columellae, and the remaining one forms very small colonies and has small calices. These species were collected along the Pacific coasts, e.g. Izu Hachijou Island, Ogasawara Islands and Ryukyu Islands, during last 30 years. Corallite morphology was measured directly with vernier calipers. Septa were counted and measured using a binocular microscope with an eyepiece micrometer.

Suborder Dendrophylliina Family Dendrophylliidae *Dendrophyllia* Blainville, 1830

Dendrophyllia suprarbuscula n. sp.
(Japanese name: Naga-juji-kisango, new)
(Plate I, Fig. 1; Plate III, Fig. 1)

Material examined

Holotype: Five colony fragments, erect straight corallites, broken basally consisting of 17 corallites.

Paratype: Remaining colony fragments consisting of 27 corallites from the holotype. Original whole colony has dome shape about 20cm diameter as shown Plate III when dredged, collected on 17 October, 1980, by K. Takahashi using a gill net at 90m depth, off Izu Hachijou Island, Tokyo, Japan. The holotype is deposited in the National Science Museum, Tokyo (NSMT-Co 1001), the paratype in the Takahashi collection.

Reference specimens: *D. arbuscula*, collected from Toyama Bay, Sea of Japan by N. Horii.

D. arbuscula, newly collected from Wakayama Prefecture and Tokyo Bay.

Description of holotype

Ten mature corallites of broken basal parts averaging 60.3mm height (range: 40.6-82.3). Corallites bud at irregular intervals, branched only once or twice, usually one branch, but only one case of three branches opposite direction occurred. Budding takes place near the calicular margin. Corallite robust, costae flat and 0.5mm width with two or three small spinous rows, epitheca undeveloped (Plate I, Fig. 1). Coenenchyme deep red to orange (Plate III, Fig.1).

Septa hexamerally arranged in 4 cycles, S5 occurred dorso-ventral and rarely lateral side. Corallites relatively large and oval, 10 mature corallites averaging 8.2mm (range: 6.3-9.8) \times 9.1mm (6.7-11.0) in calicular diameter and 3.6mm (3.0-4.0) in fossal depth. Each pair of S4 fused together before their enclosed S3, arranging Simple Pourtalès plan (Ogawa and Takahashi, 1995). At the dorso-ventral, a pair of S5 inserted and arranging Duplicate Pourtalès plan (Ogawa and Takahashi, 1995). Columella well developed, consisting of swirled elements tightly fused together. S1 exert, 0.7-1.1mm, S2 slightly exert, 0.6-0.7mm and S3 less than 0.4mm.

Etymology

The specific name *suprarbuscula* is a combination of prefix supra, meaning "over" in Latin, and the specific name of *Dendrophyllia arbuscula* Van der Horst, 1922 to which the new species is very similar.

Remarks

Unfortunately, dredged colonies were broken and we could obtain only remains as holotype and paratypes. As shown on Plate III, the whole colony is very similar to *Duncanopsammia*, but clearly differ from it in having no corallites united basally by coenosteum. Septal arrangement is very similar to *Dendrophyllia arbuscula*, which has Simple Pourtalès plan and rarely found Duplicate Pourtalès plan dorsally. On the contrary, this new species has robust and longer corallites than *D. arbuscula*, and has a Duplicate Pourtalès plan at the dorso-ventrally without exception.

Dendrophyllia paragracilis n. sp.

(Japanese name: Ayatori-kisango, new)

(Plate I, Fig. 2; Plate III, Fig. 2)

Material examined

Holotype: Colony width 7.2cm, height 8.0cm, consisting of 10 matured corallites with 6 young corallites collected on 5 November, 1995, by H. Tachikawa at 1m depth marine cave using SCUBA at Ogasawara Islands, Tokyo. The holotype is deposited in the Coastal Branch of Natural History Museum and Institute, Chiba (CMNH-ZG0310).

Paratype: Colony width 8.4cm, height 8.2 cm, consisting of 8 matured corallites with 19 young corallites, collected on 31 January, 1975, by T. Fukuda from 3 to 10m depth at Urabishi, off Kuroshima, Ryukyu Islands. It is deposited in the Kushimoto Marine Park Center, Wakayama Prefecture (K.M.P.C., label No.C-56).

Additional specimen: Colony width 8.0cm, height 12.0cm, collected on 25 January, 1988, by F. Iwase from 5m at Urabishi, off Kuroshima, Ryukyu Islands. It is also deposited in the

K.M.P.C. (label No.88-69).

Reference specimens: Twenty-two specimens of *Dendrophyllia gracilis*, newly collected from Izu Hachijou Island, Izu Ohshima Island, Tokyo and Muroto-misaki, Kochi Prefecture, Shikoku.

Description of holotype

Corallum dendroid, sparsely branching in three dimensions. The height of 8 mature corallites 26.8-59.6mm. Young corallites augmented by settlement of sexually produced planulae on the coenosteum. Corallite thin, costae very fine, 0.02 mm width with a row of blunt spicules (Plate I, Fig. 2). Coenenchyme orange (Plate III, Fig. 2).

Septa hexamerally arranged in 4 complete cycles, S5 ambiguous when present. Corallites medium size, almost circulae, 8 mature corallites averaging 7.9mm (range: 6.7-8.8) \times 8.1 mm (6.8-8.7) in calicular diameter and 4.8 mm (4.5-6.0) in fossal depth. Each pair of S4 fused before enclosed S3, further each pair of outer S4 fused with S2 forming Duplicate Pourtalès plan, these complicate septal arrangement seems like one of cat's cradle. S5 rarely appeared as rudimentary lines. Columella consists of swirled elements though variable in shape. Septa not exert from thin wall.

Etymology

The specific name *paragracilis* is a combination of prefix *para*, meaning "side" in Latin, and the specific name of *Dendrophyllia gracilis* (Milne-Edwards and Haime, 1848) (= *Cladopsammia gracilis*: recently, Cairns (1994) transferred to the genus name) to which the new species is similar.

Remarks

This new species has similar septal arrangement to *D. gracilis*, though Duplicate Pourtalès plan with thin cylindrical calice distinguishes it from *D. gracilis*, which has a Triplicate Pourtalès plan (Ogawa and Takahashi, 1995) with robust trumpet or cup shape of calice. Ecologically, this species inhabits in dark caves, and the same species was obtained from the marine cave of Ryukyu Islands (Dr. Mori of Tohoku University, personal communication).

Dendrophyllia futojiku n. sp.

(Japanese name: Futojiku-kisango, new)

(Plate II, Fig. 1; Plate IV, Fig. 1)

Material examined

Holotype: Five colony fragments broken basally, consisting of 36 corallites, collected on 6 June, 1970, by K. Takahashi at 2m depth using SCUBA, at Izu Hachijou Island, Tokyo. The holotype is deposited in the National Science Museum, Tokyo (NSMT-Co 1002).

Paratype: Twelve colony fragments broken basally, consisting of 36 corallites, collected simultaneously with the holotype. It is deposited in the Takahashi collection.

Additional specimen: One colony consisting of 26 corallites collected on 9 August, 1981, by K. Takahashi at 2m depth using SCUBA, at Izu Hachijou Island. Specimens were deposited in the Takahashi collection.

Reference specimens: All *Dendrophyllia* specimens that are reported in our previous paper (Ogawa and Takahashi, 1995).

Description of holotype

Corallum dendroid, sparsely branching in three dimensions. 5 broken corallites height 4.3-8.4cm. Corallite comparatively thick, costae very fine 0.05mm width with a small spine row. Epitheca developed. Calice almost circular. Coenenchyme orange, tentacles yellow (Plate IV, Fig. 1).

Septa hexamerally arranged in complete 4 cycles. Corallite medium size, almost circular, 7 mature corallites averaging 7.2 mm (range: 6.1-8.0) \times 7.6mm (6.6-8.6) in calicular diameter and 3.6 mm (2.5-4.0) in fossal depth. Each pair of S4 fused before enveloped S3 forming Simple Pourtalès plan. Columella spongy and well developed, almost circular, average maximum diameter 3.8mm (3.3-4.5). Inner edges of septa vertical and straight, columella occupied about 51% of the calice area. Septa not exert from the wall.

Etymology

The specific name *futojiku* meaning fat or big columella in Japanese.

Remarks

Though columella is usually variable in size in the same colony, this new species is easily distinguished from other known *Dendrophyllia* by its well developed columella without exception among the colony.

***Dendrophyllia minima* n. sp.**

(Japanese name: Mini-kisango, new)

(Plate II, Fig.2; Plate IV, Fig.2)

Material examined

Holotype: Small colony consisting of about 60 corallites collected on 24 July, 1982, by K. Takahashi at 2m depth using SCUBA, at Izu Hachijou Island, Tokyo. The holotype is deposited in the National Science Museum, Tokyo (NSMT-Co 1003).

Paratype: Small colony consisting of 51 corallites collected on 28 September, 1980, by K. Takahashi at 2m depth using SCUBA, at Izu Hachijou Island, Tokyo. It is deposited in the Takahashi collection.

Additional specimen: Small colony consisting of 20 corallites, collected at the same place for paratype. Specimens are deposited in the Takahashi collection.

Reference specimens: *Dendrophyllia compressa* Eguchi and Sasaki, 1973 newly collected from Izu Hachijou Island, Tokyo.

Description of holotype

Corallum very small, bush like, sparsely branching colony: height 3.0 cm, width 3.3 cm. Corallite thick, calice eccliptical, 10.9 mm (7.9-13.0) in length. Costae very fine, width less than 0.02 mm with a spine row. Epitheca developed. Coenenchyme orange in basal part and yellow in distal part, tentacles transparent (Plate IV, Fig 2).

Septa hexamerally arranged in complete 4 cycles. Corallite very small, 5 mature corallites averaging 4.1 mm (range; 3.7-4.2) \times 4.8mm(4.0-5.7) in calicular diameter, 3.6 mm (3.0-4.0) in fossal depth. Each pair of S4 fused before enclosed S3 forming Simple Pourtalès plan. Septa exert sharply, S1 and S2 exert 0.8-1.0 mm, and others less than 0.5 mm.

Etymology

The specific name *minima* indicates this is the smallest colony of *Dendrophyllia* hitherto known.

Remarks

The compressed shape of calice is similar to *D. compressa*, though its size is very different that *D. compressa* is 5.0 mm × 6.2 mm in calicular diameter and forms a big colony (Ogawa and Takahashi, 1995).

We revised our previous key (Ogawa and Takahashi, 1995) to the species of *Dendrophyllia* with related genera in Japan, as shown in Appendix Table.

Acknowledgements

We thank Mr. H. Tachikawa of the Chiba Central Museum for the collection, and Dr. H. Uchida of the Kushimoto Marine Park Center for loan the specimens and useful comments, Dr. Y. Shirayama of the Seto Marine Biological Laboratory, Kyoto University for useful comments, and Dr. T. Nishikawa of the Nagoya University for useful suggestions. We are also very grateful to Dr. S. D. Cairns of the Smithsonian Institution for critical reading the manuscript with valuable suggestions. This is Contribution number 32 from the Z. Nakai Laboratory.

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Appendix: Key to the 20 species of *Dendrophyllia* and related genera in Japan

1. Colony like small, low tree; main trunk of even diameter, with sparse branching or budding ^{*1}2
 Colony bushy or grass-like, main trunk obscure; branches bifurcating or irregularly budding like a bouquet3
 Colony growing upright like big tree with main trunk; extensive branching or budding from main trunk4
 Colony plocoid with no trunk, coenosteum developed between corallites, latter almost submerged to highly exsert, budding fundamentally bifurcating ^{*2}11
2. Fossa shallower than 4mm*Eguchipsammia fistula* (Alcock, 1902) Hosokisango
 Fossa deeper than 6mm*Dendrophyllia praecipua* (Gardiner and Waugh, 1938) Minami-hosokisango
3. Colony and calices smallest, 5 mm, of all species*D. minima* n. sp. Minikisango
 Calices biggest, 20mm, of all species*D. japonica* Rehberg, 1892 Nihonkisango
 Calice considerably compressed*D. compressa* Eguchi and Sasaki, 1973 ^{*3} Henpeikisango
4. Main trunk standing almost straight upright, even in diameter5
 Main trunk tapering7
 Main trunk growing in various patterns, with many branches8
5. Septa arranged with Simple Pourtalès plan6
 Septa arranged with Duplicate Pourtalès plan*D. paragracilis* n. sp. Ayatorikisango
 Septa arranged with Triplicate Pourtalès plan*D. suprabuscula* n. sp. Naga-jujikisango
6. Columella occupies almost entire calice*D. futojiku* n. sp. Futojiku-kisango
 Columella normal-sized, branches short*D. arbuscula* Horst, 1922 Juji-kisango
 Columella normal-sized, branches long*D. cylindrica* Yabe and Eguchi, 1968 ^{*4} Entoukisango
7. Septa arranged with complete Pourtalès plan*D. ijimai* Yabe and Eguchi, 1968 ^{*5} Kisango
 Septa arranged with incomplete Pourtalès plan*D. minuscula* Bourne, 1905 Koedakisango
8. Corallites budding evenly on all sides of colony9
 Corallites budding on only one side of colony, colony pseudo-bifacial*D. cyathohelioides* Yabe and Eguchi, 1968 ^{*4} Okinosekisango
 Corallites budding alternately from trunk and directed obliquely upwards10
9. Corallites almost embedded in trunk; almost septa arranged pentamerally*D. cribrosa* Blainville, 1834 Onomichikisango
 Corallites with long trunk; septa arranged hexamerally without exception*D. subcornigera* Yabe and Eguchi, 1968 ^{*4} Enourakisango
10. Corallum robust, calice rather thick and compressed*D. boschmai* Horst, 1926 Boshumakisango
 Corallum thin and slender*D. cf. florulenta* Alcock, 1902 ^{*6} Hanagatakisango
11. Branches short, calice shaped like short trumpet*Cladopsammia gracilis* (Milne-Edward and Haime, 1848) Nagaibokisango
 Branches long, calice shaped like long trumpet*C. coccinea* (Ehrenberg, 1834) Ooedakisango
 No branches, calices almost embedded in coenosteum ...*C. coarctata* (Duncan, 1876) Ooibokisango

^{*1} Cairns (1994) transferred unattached species to *Eguchipsammia* from *Dendrophyllia*

^{*2} Cairns (1994) transferred this group to *Cladopsammia* from *Dendrophyllia*

^{*3} Eguchi (1973) designated author name as Eguchi and Sasaki

^{*4} Eguchi (1934) cited this specific name with author Yabe and Eguchi without description, there are no descriptional paper until Eguchi (1968)

^{*5} Eguchi (1935) cited this specific name without description, and author name Yabe et Eguchi found in Eguchi (1965) with description in Japanese, there are no descriptional paper in English until Eguchi (1968)

^{*6} Not obtained, based on the description of Eguchi (1968)

Explanation of Plates**Plate I**

Fig. 1. *Dendrophyllia suprabuscula* n. sp.

1a: Enlarged calice ($\times 2.3$), 1b: Enlarged costae ($\times 2.6$)

Fig. 2. *Dendrophyllia paragracilis* n. sp.

2a: Enlarged calice ($\times 2.5$), 2b: Enlarged costae ($\times 3.5$)

Scales graduated in mm.

Plate II

Fig. 1. *Dendrophyllia futojiku* n. sp.

1a: Enlarged calice ($\times 2.8$), 1b: Enlarged costae ($\times 2.9$)

Fig. 2. *Dendrophyllia minima* n. sp.

2a: Enlarged calice ($\times 3.0$), 2b: Enlarged costae ($\times 3.5$)

Scales graduated in mm.

Plate III

Fig. 1. *Dendrophyllia suprabuscula* n. sp.

Fig. 2. *Dendrophyllia paragracilis* n. sp.

Plate IV

Fig. 1. *Dendrophyllia futojiku* n. sp.

Fig. 2. *Dendrophyllia minima* n. sp.







